

1154-05-1516

**Zewei Li\*** (zli128@jhu.edu) and **Hongkang Yang** (hy1194@nyu.edu). *On the  $\ell_\infty$  Distance between Two Random Permutations.*

Consider two random permutations  $X_1, X_2, \dots, X_n$  and  $Y_1, Y_2, \dots, Y_n$  that are uniformly chosen from any of the permutation of  $[n]$ . We investigate the difference among them under multiple commonly used metrics. We derive that the expected value of the distance to the power  $p$  is approximate  $\frac{2n^{p+1}}{(p+1)(p+2)}$  under the general  $\ell_p$  metric, and we also get the approximate expression of the variance of the difference. Using a specific version of the Central Limit Theorem, we prove that the distribution of the difference converges to a normal distribution for each  $p \in [1, \infty)$ . For specific interest, let  $D_\infty$  be the distance of the two random permutation under the  $\ell_\infty$  metric, we prove that  $\frac{E[D_\infty]}{n}$  converges to 1. We also extract precise estimates of the rate of convergence to 1. (Received September 16, 2019)